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ABSTRACT

This study assessed the bipolarity of cognitive style for 970 clients of the Johnson O'Connor Research Foundation, a vocational guidance service. The 462 male and 508 female examinees were aged 14 to 65 years, with a median age of 24 years. Three cognitive style tests were investigated: (1) the Kagan Matching Familiar Figures Test (KMFFT); (2) the Verbalizer-Visualizer Questionnaire (VVQ); and (3) a test of global versus analytic problem solving constructed for this study. For the KMFFT, speed and accuracy were negatively related, supporting the bipolar interpretation. For the VVQ, verbal and visual orientation were essentially independent, indicating that two distinct attributes were being measured. For the test of global and analytic problem-solving abilities, the two abilities were positively related, indicating that they are both manifestations of a single underlying ability. These findings are further supported by correlations with a battery of aptitude tests. Implications of these results for conceptualizations of cognitive style are discussed. Two tables, 3 figures, and a 14-item list of references are included. (Author/SLD)

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Is Cognitive Style Bipolar?

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of the American Psychological Association,
New Orleans, August 1989.

Abstract

This study assessed the bipolarity of cognitive style. For the Kagan Matching Familiar Figures Test, speed and accuracy were negatively related, supporting the bipolar interpretation. For the Richardson Verbalizer-Visualizer Questionnaire, verbal and visual orientation were essentially independent, indicating that two distinct attributes are being measured. For a test of global and analytic problem-solving abilities, the two abilities were positively related, indicating that they are both manifestations of a single underlying ability. These findings were further supported by correlations with a battery of aptitude tests. Implications of these results for conceptualizations of cognitive style are discussed.

Acknowledgments

I would like to acknowledge the contributions of Dr. Kathy Green, who helped develop the Global-Analytic Problem-Solving Test and performed an earlier analysis and wrote an earlier report on these data (Green, 1988); of Dr. Richard Smith, who also worked on the global-analytic test; and of the Chicago, Houston, and San Francisco offices of the Johnson O'Connor Research Foundation, who collected the data.

Is Cognitive Style Bipolar?

Cognitive style has commonly been conceptualized in terms of one or more bipolar dimensions, with each end of a dimension representing a qualitatively different manner of cognitive functioning (Messick, 1976). For example, on the Rod and Frame Test (Oltman, 1968), scores at one end indicate field independence, the quality of perceiving objects relatively independently of their contexts, and scores at the other end indicate field dependence, the quality of perceiving objects and their contexts in a (relatively) global, undifferentiated manner. Persons who are field independent are thought to be advantaged on tasks that require cognitive analysis and structuring (Goodenough, 1976). Field dependent persons are believed to manifest greater social skills (Witkin & Goodenough, 1977). As a second example, the Kagan (1969) Matching Familiar Figures Test (MFFT) distinguishes impulsive individuals, who show high speed but relatively poor accuracy, from reflective individuals who exhibit good accuracy but low speed. Impulsive persons are thought to be better suited for pursuits involving a rapid conceptual tempo (such as perhaps criminal law or teaching), while reflective persons are better matched with activities emphasizing precision and not speed, including academic performance (Messer, 1970). Other cognitive style dimensions that are viewed as bipolar include the following: leveling-sharpening (Messick, 1970), focusing-scanning (Messick, 1970), verbal-visual (Richardson, 1977), and global-analytic (Brumby, 1982).

Bipolar constructs offer a heuristic advantage in that a single dimension can explain two qualities at once. At the same time, they (bipolar constructs) require that the two qualities be shown to be mutually exclusive, or, at the least, inversely related to a substantial degree. Witkin and Goodenough (1977; Goodenough, 1976) have presented evidence of this sort for field independence: evidence that field independent persons show the properties of field independence and not field dependence, and that field dependent persons show field dependent and not field independent qualities. Alternatively, Kagan makes allowances for persons who show fast, accurate, and slow, inaccurate performance on his test. These persons are customarily eliminated from his analysis, which then contrasts fast-inaccurate and slow-accurate individuals. Thus, Kagan forces an inverse relationship on his variables by restricting attention to only those persons for whom the inverse relationship holds. For those persons, he and others have shown contrasting performance on a number of criteria (Messer, 1976).

In this study, I evaluate the bipolarity of three cognitive style tests: Kagan's MFFT, Richardson's (1977) Verbalizer-Visualizer Questionnaire (VVQ); and a test of "global" versus analytic problem-solving on a test containing both types of

reasoning problems. Each of these tests permitted the separate measurement of the two qualities thought to be inversely related, forming the bipolar continuum:

1. On the MFFT, the speed (time with the sign reversed) and accuracy scores are expected to be inversely related, creating a continuum from low speed-high accuracy to high speed-low accuracy persons. (As noted, examinees who do not fit the inverse pattern are usually dropped from the analyses, leaving the two contrasting groups.)

2. The VVQ contains separate verbal and visual items, which are customarily scored in opposite directions to create a continuum from high visual-low verbal orientation to low visual-high verbal orientation.

3. The Global-Analytic Problem-Solving Test, constructed for this study, contains analytic items that can be solved most readily by systematic step-by-step reasoning and "global" items that depend for their solution on particular insights. To form a style score, one subtracts the global score from the analytic score to form a continuum from low analytic-high global to high analytic-low global style.

In this study, I examined the relationships between the two subscores for each of the tests to see if they appeared to represent inversely related--and therefore bipolar--attributes.

Method

Examinees

The examinees for this study were 970 clients of the Johnson O'Connor Research Foundation. These examinees paid a fee to receive aptitude testing, usually for purposes of vocational planning. Of the examinees, 462 were male and 508 were female, with an age range of 14 to 65 with a median of 24 years. About 218 were high school students, generally college-bound, when tested; 225 were college students; and 527 were adults, generally college graduates.

Measures

Matching Familiar Figures Test (Kagan, 1969). The adult version of the MFFT consists of 12 relatively difficult matching-to-standard items. On each item, the examinee looks at the standard figure (e.g., a lion) and then must choose which of eight choices is an exact replication of the standard figure. The instructions do not make clear whether speed of accuracy is more important, and examinees do not receive feedback on the performance during the test. Because of these factors, some examinees emphasize speed more in their efforts, while others emphasize accuracy.

The accuracy score for the MFFT consisted of the number of items the examinee answered correctly. For the speed score, the times to respond for the 12 items were summed, and then the sign was reversed so that low scores represented (relatively) low speed and high scores high speed. The MFFT has been used extensively in previous studies of cognitive style. For reviews, see Messer (1976) and Baron (1982).

Verbalizer-Visualizer Questionnaire (Richardson, 1977). The VVQ was developed by Richardson from an instrument used by Paivio (1971). The test consists of 15 true-false questions regarding use of or skill with verbal material (seven items) and visual imagery (eight items). Sample items are shown in Table 1. The verbal score in this study consisted of the number of the seven verbal items answered in the verbal direction, while the visual score similarly was the number of visual items answered in the visual direction.

Global-Analytic Problem-Solving Test (Green, 1988). The global-analytic test was developed by Kathy Green, Richard Smith, and others at the Johnson O'Connor Research Foundation and consists of two groups of items: six analytic problems that, as noted earlier, can be solved most readily by systematic step-by-step reasoning; and six global problems that depend for their solution on particular insights and are resistant to solution by analytic means. Sample items are shown in Table 1.

The global-analytic test was scored by assigning zero to three points to each examinee on each item. Examinees who answered an item incorrectly or failed to answer within the time limit received zero points. The remaining examinees for each item were assigned one to three points in roughly equal proportions based on their response times. The global and analytic scale scores were formed by summing the six items in each group.

Procedures

The examinees took the three cognitive style tests during the course of one and one-half days of testing, primarily cognitive aptitude tests. The MFFT and global-analytic tests were administered individually, while the VVQ was self-administering. A total of 870 examinees completed the MFFT, 800 the VVQ, and 550 the global-analytic test.

Results

The reliabilities for the various scales and the interscale correlations are shown in Table 2.

Table 1

Sample Items from the Verbalizer-Visualizer Questionnaire
and the Global-Analytic Problem-Solving Test

VVO:

Verbal: I enjoy doing work that requires the use of words.

Visual: My thinking often consists of mental pictures of images.

Global-Analytic test:

Global: A ship is at anchor. Over its side hangs a rope ladder with rungs a foot apart. The tide rises at the rate of 8 inches per hour. At the end of six hours, how much of the rope ladder will remain above water, assuming that 8 feet were above water when the tide began to rise?

Analytic: The witness said, "I heard my clock strike yesterday, about 10 minutes before the shot was fired. I didn't count the chimes, but I'm sure it struck more than once and that it struck an odd number." The witness had been out all morning, and his clock stopped at 5 minutes to 5 the same afternoon. When was the shot fired?

Table 2

Reliabilities and Correlations for the Cognitive Style Tests

	MFFT		VVQ		G-a test	
	Spd	Accur	Verb	Vis	Glob	Analyt
MFFT						
Speed	--	<u>-.63</u>	NS	.11	NS	-.09
Accuracy		--	NS	NS	.19	.21
VVQ						
Verbal			--	<u>.12</u>	.16	.21
Visual				--	NS	NS
Global-analytic test						
Global					--	<u>.45</u>
Analytic						--
Reliability	.93	.72	.65	.68	.54	.53

Notes. Decimals omitted. Correlations between contrasted qualities within tests underlined. Only correlations significant at .05 level shown.

Intratest Correlations

The speed and accuracy scores on the MFFT correlated $-.63$. This supports Kagan's interpretation of impulsivity (high speed-low accuracy) and reflectivity (low speed-high accuracy) as opposite poles of a single dimension. A two-way median split (Figure 1) shows 76.6% of the examinees falling into either the fast-inaccurate or slow-accurate categories.

VVQ verbal and visual scores correlated $.12$. This indicates that verbal and visual inclinations are essentially independent rather than being inversely related in a single continuum. A two-way median split (Figure 2) shows nearly equal numbers of examinees in three of the four groups, with fewer examinees in the high verbal-low visual group.

For the problem-solving test, the correlation between performance on the global and analytic portions was $.45$ (when corrected for attenuation, $.84$), indicating that the two abilities are components of a single dimension and not bipolar. A two-way median split (Figure 3) shows that only 34.9% of the examinees are high on one ability and not the other, and many of these cases are probably due to measurement error.

Correlations with Aptitude Measures

The correlations for MFFT speed and accuracy with the battery of aptitude measures tended to be in opposite directions, which is consistent with the notion that the MFFT measures a single bipolar dimension of individual differences. For example, speed and accuracy, respectively, correlated $-.23$ and $.25$ with English vocabulary and $-.12$ and $.31$ with a spatial visualization measure.

The correlations for verbal and visual orientations support their status as distinct, independent qualities and not opposite poles of a single dimension. The verbal score correlated $.46$ with vocabulary and $.25$ with verbal associative memory, while the visual correlations were less than $.10$ with both measures.

The correlations for global and analytic problem-solving tended to be quite similar to each other, which is consistent with the earlier finding that they represent a single individual difference dimension. For example, global and analytic abilities both correlated $.35$ with vocabulary and correlated $.29$ and $.35$ with memory for visual designs.

Implications

In summary, for two of the three cognitive style tests, the contrasted qualities are not inversely related and therefore not bipolar. Global and analytic problem-solving abilities appear to be best represented by a single unipolar dimension ranging from

low to high problem-solving ability. Verbal and visual orientations appear to be separate interest/ability variables.

One may note, however, that almost 50% of the examinees scored above the median for one inclination and below for the other. These examinees can legitimately be characterized as (a) verbal and not visual or (b) visual and not verbal. This may represent an alternative conceptualization for cognitive style: not as a general dimension (or set of dimensions) that characterize all persons, but rather as a quality that emerges as a result of distinctive profiles in abilities and interests. Thus, the person who is high in spatial ability and low in verbal ability may adopt a "visual" cognitive style. Supporting this point, Sternberg and Salter (1982) cite evidence that the most efficacious strategies for persons on cognitive tasks depend on their patterns of abilities. They refer to these phenomena as "aptitude-strategy" (p. 13) interactions. If visual strategies show greater efficacy for a person over time than verbal strategies, one could expect that the person would come to rely on visual strategies more and more. Hence the person would eventually develop a visual style. By the same process, another person might adopt a "style" of applying quantitative analyses whenever possible and have a "quantitative" style. The list of potential styles is infinite.

Again, any particular style is likely to be relevant only to a particular group of persons, and these persons are likely to have distinctive ability patterns. In the sample studied here, the low verbal-high visual persons on the VVQ (classified by the median splits) averaged one-third of a standard deviation below the mean on English vocabulary, while the high verbal-low visual group averaged two-thirds of a standard deviation above the mean. These findings suggest that there may be further profit in studying cognitive styles in conjunction with ability patterns. Also, as noted by Sternberg and Salter (1982), studying particular strategies and cognitive processes in conjunction with dispositional variables may illuminate the processes underlying the style-ability relationships.

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Figure 1
Two-Way Median Split
on the MFFT

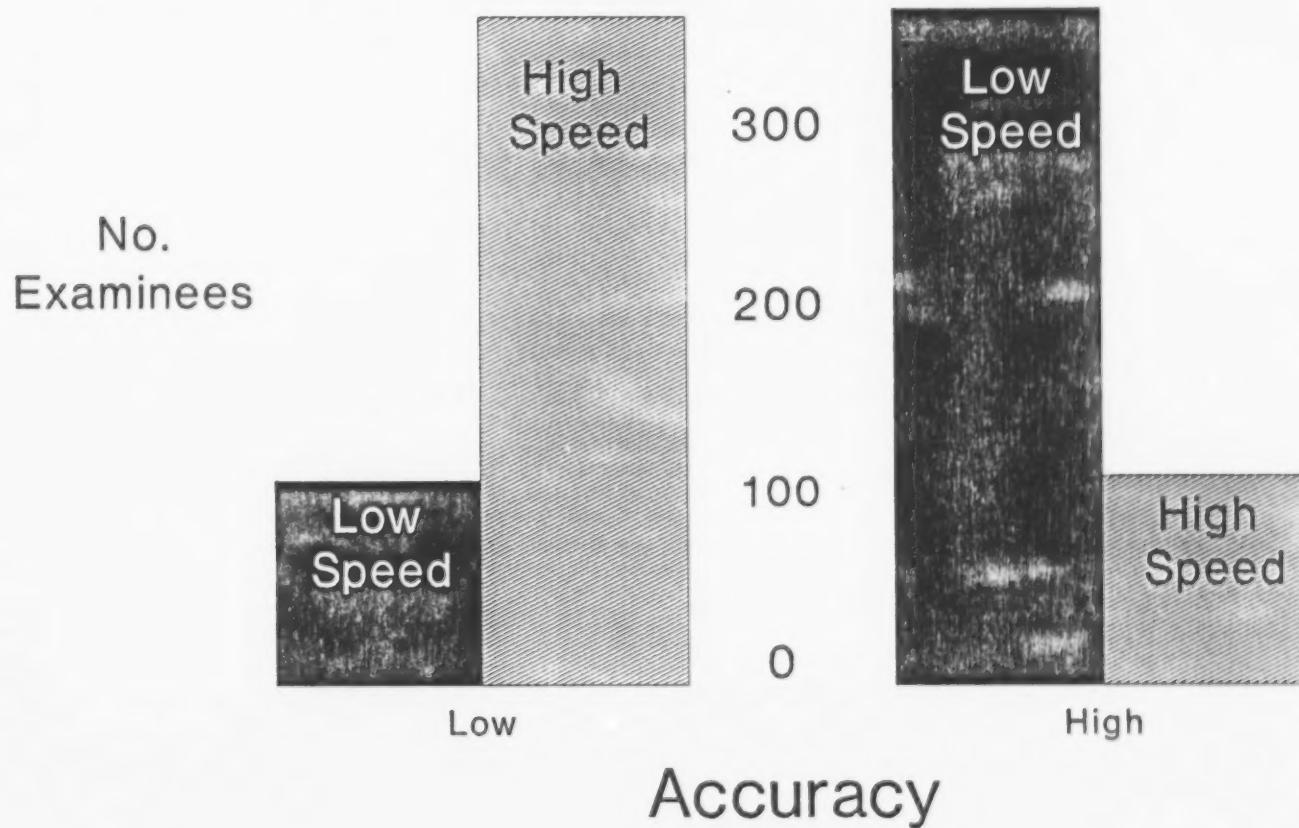


Figure 2
Two-Way Median Split
on the VVQ

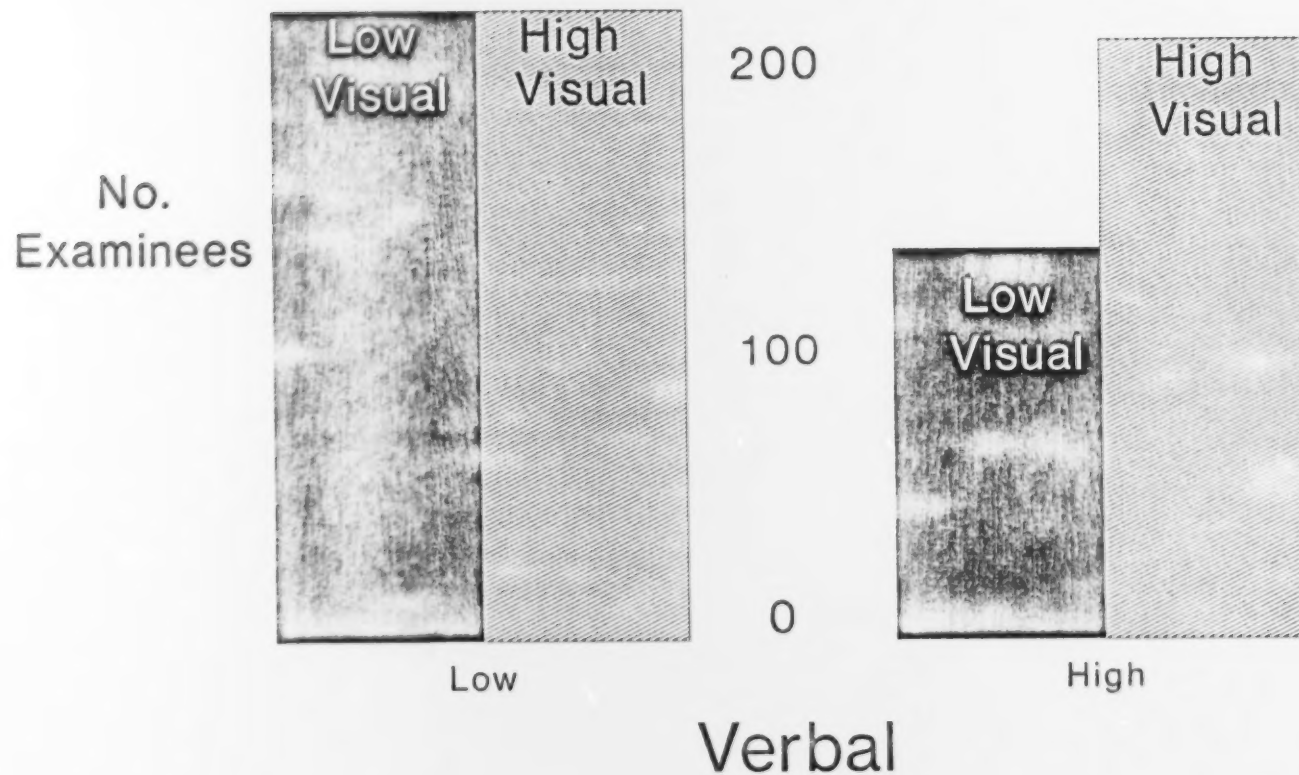


Figure 3
Two-Way Median Split
on the Global-Analytic Test

